April 5, 1966 YUKIYA IIMURA 3,244,401

MOTOR OPERATED SCREW JACK

Filed April 6, 1964 2 Sheets-Sheet 1

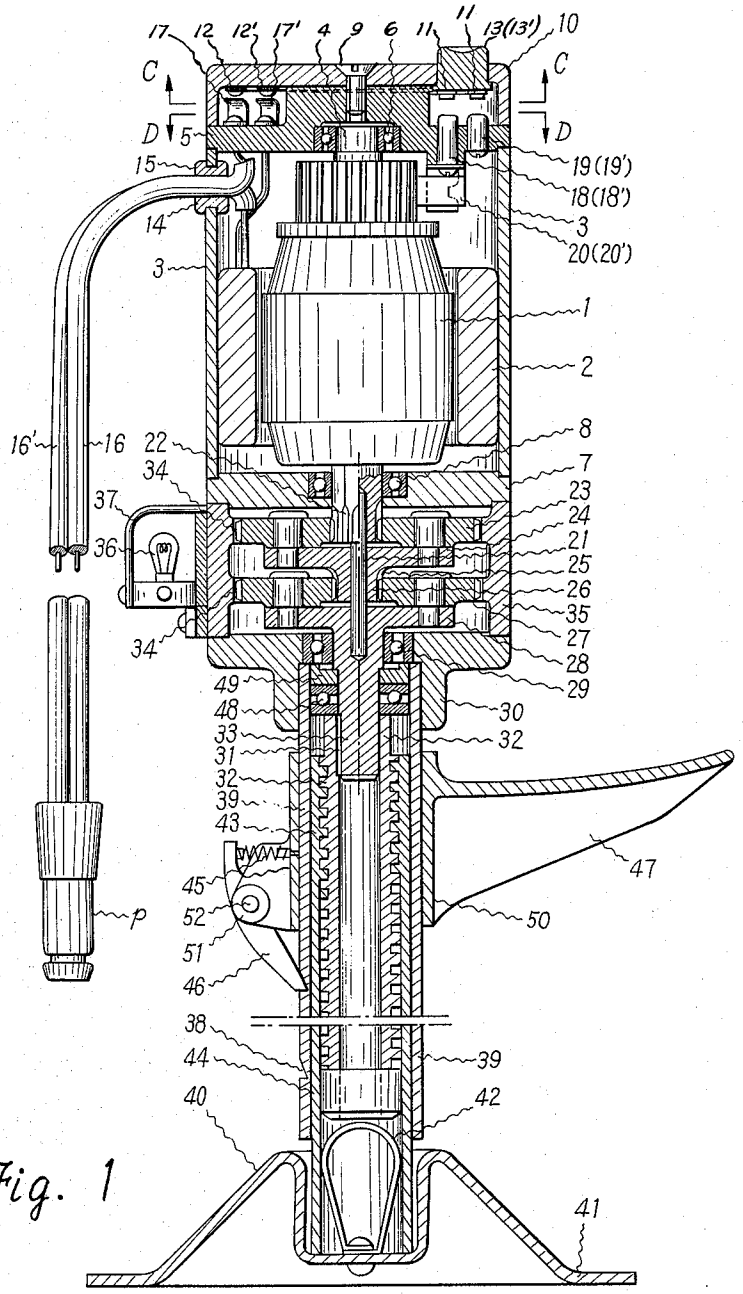


Fig. 1

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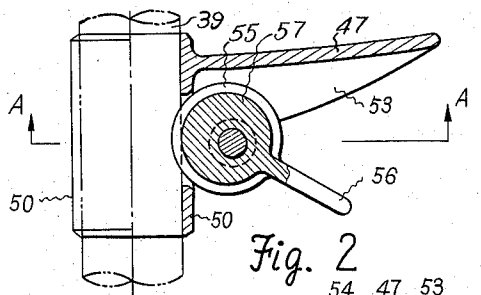


Fig. 2

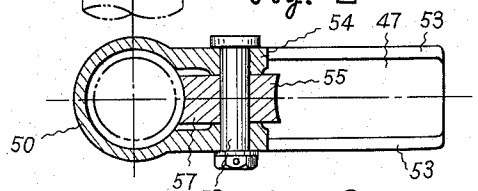


Fig. 3

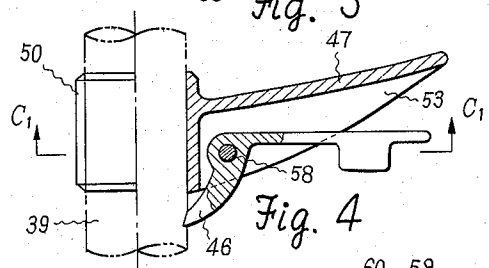


Fig. 4

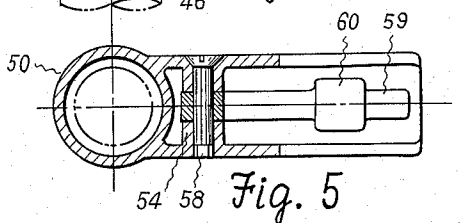


Fig. 5

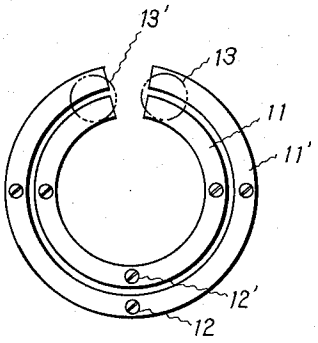


Fig. 6

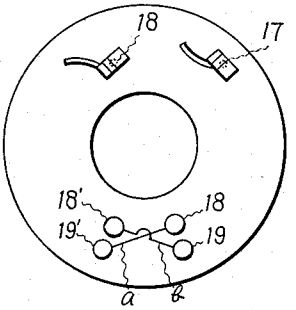


Fig. 7

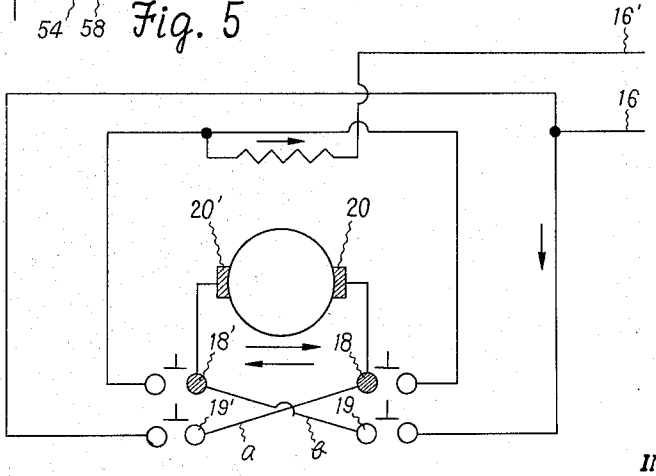


Fig. 8

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3,244,401

MOTOR OPERATED SCREW JACK

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Claims priority, application Japan, Apr. 2, 1963, 38/30,126
4 Claims. (Cl. 254—103)

The present invention relates to a motor jack provided with a small electric motor.

A main object of the present invention is to provide a motor jack extremely small in size and light in weight and having a small motor that can be operated from a lighter outlet on the dash panel of a motor car, yet suitable for raising a motor vehicle.

Another object of the invention is to provide a motor jack foolproof and easy to handle, said motor jack being as small and light as possible.

Another object of the invention is a simple switch for changing the direction of rotation of the jack motor.

A further object of the invention is a motor jack equipped with a transmission having a large reduction ratio, yet small in size.

Other objects of the invention will become apparent as the disclosure proceeds.

It is sometimes necessary to lift a car for repair. A hand operated jack is usually carried on a motor car for this purpose. A hook on the jack engages the body of the car. It requires a certain muscular strength to operate such a manual jack. If the hook of the jack slips from the car body an unskilled operator of the jack standing close to the car, as required, may be injured.

A portable jack of this kind is used only rarely, and the time of use is short. The motor jack of the present invention employs a low-voltage and low-ampere motor. It draws current through a plug on the lead wire of the motor which may be inserted into the lighter outlet on the dash panel of the car. It can be operated even by an unskilled person who may reverse the direction of the rotation of the motor by remote push buttons so that slipping of the jack hook from the car body cannot cause an accident.

In the drawing:

FIG. 1 is a vertical sectional view of a first embodiment of the invention;

FIG. 2 is a vertical sectional view of a modified hook for the jack of FIG. 1;

FIG. 3 shows the hook of FIG. 2 in section along the line A—A;

FIG. 4 shows another modified hook in vertical sectional view;

FIG. 5 shows the device of FIG. 4 in section along the line B—B;

FIG. 6 shows the jack of FIG. 1 in section along the line C—C;

FIG. 7 shows the jack of FIG. 1 in section along the line D—D; and

FIG. 8 is a diagram of the electric circuit of the motor jack.

In the motor jack shown in FIG. 1 an electric motor (12 volts D.C., 80 w.) consisting of a rotor 1 and a stator 2 is arranged in a casing 3, said stator 2 being fixed on the casing and said rotor 1 being fixed on the shaft 4 of the motor. The upper end of the shaft 4 is supported by means of ball bearings 6 on the plastic end wall 5 on the upper end of said casing 3 and the lower end thereof is supported by means of ball bearings 8 on a supporting plate 7 on the lower end of said casing 3.

The electric motor used is of a low-voltage and low-ampere type, its frequency of operation is comparatively low, its operating time is short, and the switch mechanism

which controls said motor for normal or reverse rotation has a construction adapted to this application. The center portions of two concentric, resilient, part-circular conductive strips 11, 11′ are fixed by screws 12, 12′ on the internal surface of a switch cover mounted on the end wall 5 of the motor by a screw 9. Push buttons 13, 13′ are engageable with the resiliently movable free ends of the strips 11, 11′. The push buttons project through openings in said switch cover 10. Two lead wires 16, 16′ pass through an opening 15 equipped with a grommet 14 near the upper end of the casing 3 from the motor mechanism to a plug P shaped to be inserted into the lighter outlet on the dash panel of a motor car. The lead 16 makes contact with the set screw 12 by means of a contact spring 17 which is fixedly attached to the end wall 5 and is thereby connected to the conductive strip 11′. The other lead wire 16′ is connected to one terminal of the series-connected field coil of the stator 2. The other terminal of said field coil is connected to a contact spring 17′ fixed on the end wall 5 for contact with the screw 12′ and the strip 11. Fixed contacts 18, 18′ and 19, 19′ are arranged on the end wall 5 in alignment with the push buttons 13, 13′. The contacts 19′, 18 are connected by a wire *a* (FIG. 7) and the contacts 18′, 19 by wire *b*. The contacts 18, 18′ are further connected to the rotor 1 by carbon brushes 20, 20′ respectively.

The electric circuit is shown in FIG. 8. The push buttons 13, 13′ are normally held away from the contacts 18, 18′, 19, 19′ by the elasticity of the circular conductive strips 11, 11′, and the circuit is interrupted. When the push button 13 is depressed, the corresponding ends of the strips 11, 11′ touch the contacts 18, 19, and a circuit (as shown by an arrow) which connects the power source 16, 16′ with the stator 2 is closed in such a manner that the motor rotates in one direction for lift operation. When the push button 13 is released, the ends of the strips 11, 11′ are detached from the fixed contacts 18, 19 by their resiliency and return to the initial position, thereby interrupting the circuit. As will presently become apparent, the motor lifts a car by means of a pair of threadedly engaged members whose threads have a small pitch so that the jack is self-locking under load when the motor stops. When the push button 13′ is depressed, the other ends of the strips 11, 11′ are connected with the contacts 18′, 19′, a reverse circuit is closed and the motor is rotated in the reverse direction for the removal of the jack from the load.

A reduction gear mechanism is driven by the shaft 4 of the electric motor. As shown in FIG. 1, it includes a pin 21 movably fitted in the hollow lower end of the shaft 4. A pinion 22 is formed by teeth cut into the lower end of said shaft 4. A sleeve 26 is integral with a flange 24 rotatably supporting two planet gears 23 which mesh with said pinion 22. Another pinion 25 is formed by teeth cut into the sleeve 26 which is rotatably mounted on said pin 21. The lower end of the pin 21 is rotatably received in a hollow portion of a planet carrier 28 rotatably supporting two planet gears 27 which mesh with said pinion 25. The planet carrier 28 is rotatably supported on a supporting plate 30 by ball bearings 29 and is integral with an intermediate shaft 33 of which the lower end is fixedly mounted in a hollow screw 32 by a key 31. The flange 24 planet carrier 28, and associated elements are enclosed in a gear casing 35 whose internal surface is provided with internal ring gears 34. The planet gears 23, 27 simultaneously mesh with the internal gears 34 and the pinions 22, 25. The gear casing is provided on the outside with a light source 37 including an electric lamp 36.

An outer tube 39 has axially spaced notches 38. Its upper end is fixedly attached to the supporting plate 30.

A hollow cylinder 44 held in place by a resilient member 42 is slidably received in the outer tube 39, and its lower end is releasably attached to a foot 40 having a flat bottom plate 41. The upper end 43 of the cylinder 44 is internally threaded and threadedly engages the screw 32. The screw is provided on its upper end with a thrust bearing 48 which abuts against a supporting plate 49 fixed on the intermediate shaft 33.

The electric light 37 employs an ordinary low-voltage lamp 36 powered from the lighter plug P in the same manner, not shown, as the motor. The permanently magnetic base plate 37' of the light source attaches the lamp to the side of the gear casing 35.

The hook 47 is slidably mounted on the outer tube 39 by a sleeve 50, and a bracket 51 projects from the other side of the sleeve. A pawl 46 is rotatably supported on the bracket by a pin 52, and a compression spring 45 is so arranged on the rear end of the pawl 46 as to urge the tip of the pawl 46 into engagement with the notches 38.

Thus the motor jack of the invention is small and light enough to be carried in the car. In an emeregency, it is operated in the following manner: The plug P is inserted in the lighter socket. The hook 47 is adjusted by operating the push buttons 13, 13'. The hook 47 is engaged with a portion of the car such as the bumper, and the push button 13 is depressed so that the motor rotates the intermediate shaft 33 and the screw 32 attached to the shaft by the key 31, whereby the outer tube 39 together with the hook 47 move upward and are held in the raised position by the pawl 46. When the push button 13' is pressed, and when the pawl 46 is disengaged, the motor rotates in the opposite direction, so that the hook 47 is lowered and may be removed from the body of the car.

FIGS. 2 and 3 show a modified hook 47' integral with a sleeve 50 which is slidably mounted on the outer tube 39. The hook 47' is reinforced by two ribs 53 provided with bearing portions 54. An eccentric disc is rotatably mounted in the bearings 54 by a pin 58. The eccentric disc 57 has a handle 56 and a concave surface 55 which conforms to the outer tube 39. FIGS. 4 and 5 show another hook 47'' integral with a sleeve 50. The hook is reinforced by two ribs 53' provided with bearing portions 54' near the sleeve 50. A pin 58' is supported in the bearings 54' and pivotally carries a detent 46' having an arm 59 on which a weight 60 is attached to urge the detent or pawl 46' into engagement with the tube 39.

What is claimed is:

1. A motor jack comprising, in combination:

(a) a motor having a stator and a rotor, said stator including a field coil having two terminals;

(b) a shaft fixedly attached to said rotor;

(c) a first pinion on said shaft:

(d) a switch mounted on said motor, said switch including

(1) a switch cover formed with two openings,

(2) two resilient conductive means attached to said cover, each conductive means having two movable end portions,

(3) two push button members slidably guided in respective openings of said switch cover, a pair of respective end portions of said resilient conductive means engaging each of said push buttons and normally holding the same in a position in which they outwardly project from said cover;

(4) a pair of fixed contacts aligned with each of said push buttons in the direction of sliding movement thereof for contact with respective end portions of the associated pair of end portions when said push button is pressed inward of said cover from said position;

(e) two leads respectively connected to one of said resilient conductive means and to one of the terminals of said field coil;

(f) plug means connected to said leads for connecting the same with an electric cigarette lighter socket in a motor car for energizing said motor from a source of current in said car;

(g) first conductor means connecting the other terminal of said field coil to the other one of said resilient conductive means;

(h) second conductor means connecting said fixed contacts in circuit with each other and with said rotor for rotating the same in one direction when one of said push buttons is pressed while said plug is connected to said lighter socket, and for rotating said rotor in the other direction when the other push button is pressed;

(i) a first planet carrier coaxial with said shaft;

(j) a planet gear rotatably mounted on said carrier and meshingly engaging said first pinion;

(k) a second pinion coaxially fixed on said first planet carrier;

(l) a second planet carrier coaxial with said first carrier;

(m) a planet gear rotatably mounted on said second planet carrier and meshingly engaging said second pinion;

(n) ring gear means coaxial with said planet carriers and secured to said stator against relative rotation, said planet gears meshingly engaging said ring gear means;

(o) a screw coaxially secured to said second planet carrier;

(p) an elongated hollow internally threaded member threadedly engaging said screw;

(q) foot means on said hollow member for supporting the same on a supporting surface;

(r) an outer tube secured to said stator and movably enclosing at least a portion of said hollow member and of said screw; and

(s) a hook member axially secured on said outer tube.

2. A jack as set forth in claim 1, further comprising pawl means on said hook member releasably engaging said outer tube for axially securing said hook.

3. A jack as set forth in claim 1, wherein said screw is tubular and a portion of said second planet carrier axially extends into said tubular screw, and key means engaging said screw and said second planet carrier for preventing relative rotation thereof.

4. A jack as set forth in claim 1, wherein said motor includes stationary brush means movably engaging said rotor for transmitting current thereto, said brush means being connected in circuit with said fixed contacts by said second conductor means.

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